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EXAMINER	
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ART UNIT	PAPER NUMBER
1634	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/756,767	KYO ET AL.	
	Examiner	Art Unit	
	Robert T. Crow	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17,18,20-27 and 29-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17,18,20-27 and 29-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

FINAL ACTION

Status of the Claims

1. This action is in response to papers filed 5 July 2006 in which the drawings and claims 17, 18, 20, 21, and 33 were amended, claims 19 and 28 were canceled, and no claims were added. All of the amendments have been thoroughly reviewed and entered.

2. The previous rejections under 35 U.S.C. 112, second paragraph, not reiterated below are withdrawn in view of the amendments.

3. The previous rejections under 35 U.S.C. 102(b) and 35 U.S.C. 103(a) not reiterated below are withdrawn in view of the amendments. Applicant's arguments have been thoroughly reviewed and are addressed following the rejections necessitated by the amendments.

4. It is noted that claims 1-42 are listed as pending in the Remarks filed 5 July 2006. Claims 1-16 and 34-42 were previously withdrawn, and claims 19 and 28 have been cancelled. Therefore, claims 17-18, 20-27, and 29-33 are under prosecution.

Drawings

The revised drawings were received on 5 July 2006. The new drawings are accepted.

Information Disclosure Statement

The Information Disclosure Statement filed 12 April 2004 and considered by the examiner on 30 March 2006 has been corrected to indicate the proper number of the U.S. Patent to Corn et al. The corrected reference has also been included on the form PTO-892.

Claim Objections

Claim 32 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Independent claim 21 already requires measuring an interaction on an array having a background region on which a hydrophilic biopolymer molecule is immobilized.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21-27 and 28-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 21-27 and 28-33 are indefinite in claim 21, which recites the limitation "other than the area" in line 4 of claim 21. There is insufficient antecedent basis for "the area" in the claim. It is suggested that the claim be amended to reflect precisely what the "area" is and what function it serves in the method.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 17-18, 21-22, 24, 26-27, 29-30, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Corn et al (U.S. Patent No. 6,127,129, issued 3 October 2000).

Regarding claim 17, Corn et al teach a biomolecule interaction measuring method comprising the steps of:

providing a double-stranded oligonucleotide array comprising a background region on which a hydrophilic polymer molecule is immobilized and a region on which a plurality of double-stranded

oligonucleotides are immobilized on a metal substrate (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, the substrate is gold, and the attached DNA is double stranded; column 12, Example 1), and

measuring the interaction between said double-stranded oligonucleotides and a biomolecule or aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of double-stranded DNA sequences; Example 1),

wherein each of said double-stranded oligonucleotide include a first single-stranded oligonucleotide and a second single-stranded oligonucleotide, said first and second single-stranded oligonucleotides being entirely or partially bonded together in a complementary manner to form said double-stranded oligonucleotide (e.g., the array has double stranded DNA sequences; Example 1),

wherein among said first and second single-stranded oligonucleotides, only said first single-stranded oligonucleotide is bonded to said substrate (e.g., Figure 5, wherein the double-stranded DNA is prepared by immobilizing an oligonucleotide [e.g., D2] and hybridizing the complement to the sequence; column 13, lines 7-28), and

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

Regarding claim 18, Corn et al teach the method of claim 17, wherein said first single-stranded oligonucleotide is bonded to said substrate by use of a cross-linking agent including a heterobifunctional hydrophilic polymer molecule expressed by a general formula X-R-Y (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), wherein:

X is a functional group on a surface of a solid surface or a functional group to be bonded with a functional group introduced to the surface of said solid surface (e.g., X is the mercapto group of MUAM; column 3, lines 58-59),

Y is a functional group to be bonded to said first single-stranded oligonucleotide (e.g., Y is the amine group of MUAM; step 5 of Figure 4); and

R is a repeating unit of said polymer (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4).

Regarding claim 21, Corn et al teach a biomolecule interaction measuring method comprising:

measuring the interaction between a first biomolecule and a second biomolecule or an aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of single-stranded and double-stranded DNA sequences; Example 1), by use of a solid substrate with a solid surface comprising a background region on which a hydrophilic polymer molecule is immobilized other than the area (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, and the PEG is not on the other areas of the substrate) and a region on which said first biomolecule is immobilized (e.g., Figure 1, wherein DNA is immobilized on areas other than those where the PEG is immobilized),

wherein said first biomolecule is immobilized on said substrate by using a cross-linking agent including a heterobifunctional hydrophilic polymer molecule expressed by a general formula X-R-Y (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), wherein:

X is a functional group on a surface of a solid surface or a functional group to be bonded with a functional group introduced to the surface of said solid surface (e.g., X is the mercapto group of MUAM; column 3, lines 58-59),

Y is a functional group to be bonded to said first biomolecule (e.g., Y is the amine group of MUAM, which attaches to the DNA; step 5 of Figure 4); and

R is a repeating unit of said polymer (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4),

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

Regarding claim 24, Corn et al teach the method of claim 21, wherein said functional groups X and Y are thiol and amino (e.g., the linker is MUAM [i.e., 11-mercaptoundecylamine; column 3, lines 58-59], wherein mercapto is a thiol group).

Regarding claim 26, Corn et al teach the method of claim 21, wherein said substrate includes plural kinds of first biomolecules arranged thereon in an array arrangement (e.g., Figure 1 and Example 1, wherein example 1 has two different DNA sequences immobilized on a checkerboard surface; column 12, lines 45-55).

Regarding claim 27, Corn et al teach the method of claim 21, wherein said first biomolecule is nucleic acid (e.g., Figure 1 and Example 1).

Regarding claim 29, Corn et al teach the method of claim 21, wherein the interaction between said first biomolecule and said second biomolecule or aggregate thereof is measured through surface plasmon resonance imaging (e.g., Figure 6; column 5, lines 40-50).

Regarding claim 30, Corn et al teach the method as defined in claim 21, wherein said second biomolecule is a protein (e.g., single-stranded DNA binding protein; Example 1).

Regarding claim 32, Corn et al teach the method of claim 21, wherein said measurement is performed using an array which has a background region on which a hydrophilic polymer molecule is immobilized (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, and the PEG is not on the other areas of the substrate).

2. Claims 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Corn et al (U.S. Patent No. 6,127,129, issued 3 October 2000) as evidenced by Jolly et al (Modern Inorganic Chemistry, 1984, McGraw Hill, inside cover).

Regarding claim 22, Corn et al teach the biomolecule interaction measuring method of claim 21 comprising:

measuring the interaction between a first biomolecule and a second biomolecule or an aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of double-stranded DNA sequences; Example 1), by use of a solid substrate with a solid surface comprising a background region on which a hydrophilic polymer molecule is immobilized other than the area (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, and the PEG is not on the other areas of the substrate) and a region on which said first biomolecule is immobilized (e.g., Figure 1, wherein DNA is immobilized on areas other than those where the PEG is immobilized),

wherein said first biomolecule is immobilized on said substrate by using a cross-linking agent including a heterobifunctional hydrophilic polymer molecule expressed by a general formula X-R-Y (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), wherein:

X is a functional group on a surface of a solid surface or a functional group to be bonded with a functional group introduced to the surface of said solid surface (e.g., X is the sulfur atom of MUAM; step 5 of Figure 4),

Y is a functional group to be bonded to said first biomolecule (e.g., Y is the amine group of MUAM, which attaches to the DNA; step 5 of Figure 4); and

R is a repeating unit of said polymer (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4),

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

Corn et al teach the heterobifunctional hydrophilic biopolymer is MUAM (column 4, lines 1-3, and Figure 4; wherein MUAM is hydrophilic, column 7, lines 53-54). Corn et al show the Au bound MUAM as having the formula -S-$(CH_2)_{11}$-NH_2 (Figure 2). Jolly teaches the following atomic weights: S=32.064; C=12.011; H=1.008; and N=14.007; inside back cover); therefore, the molecular weight of MUAM is 202.384.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 17, 20, 21, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Corn et al (U.S. Patent No. 6,127,129, issued 3 October 2000) in view of Noblett (U.S. Patent No. 6,362,004 B1, issued 26 March 2002).

Regarding claim 20, Corn et al teach the biomolecule interaction measuring method of claim 17 comprising the steps of:

providing a double-stranded oligonucleotide array comprising a background region on which a hydrophilic polymer molecule is immobilized and a region on which a plurality of double-stranded oligonucleotides are immobilized on a metal substrate (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, the substrate is gold, and the attached DNA is double stranded; column 12, Example 1), and

measuring the interaction between said double-stranded oligonucleotides and a biomolecule or aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of double-stranded DNA sequences; Example 1),

wherein each of said double-stranded oligonucleotide include a first single-stranded oligonucleotide and a second single-stranded oligonucleotide, said first and second single-stranded oligonucleotides being entirely or partially bonded together in a complementary manner to form said double-stranded oligonucleotide (e.g., the array has double stranded DNA sequences; Example 1),

wherein among said first and second single-stranded oligonucleotides, only said first single-stranded oligonucleotide is bonded to said substrate (e.g., Figure 5, wherein the double-stranded DNA is prepared by immobilizing an oligonucleotide [e.g., D2] and hybridizing the complement to the sequence; column 13, lines 7-28), and

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

Corn et al do not teach markers indicative of spots.

However, Noblett et al teach the use of microarrays comprising immobilized nucleic acids (column 1, lines 20-30) having marks indicative of spots (i.e., fiducials, Abstract) with the added

advantage of allowing positioning and alignment of the substrate for spot analysis and comparison procedures (Abstract).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the method as taught by Corn et al with the fiducials as taught by Noblett with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because the modification would have resulted in allowing positioning and alignment of the substrate for spot analysis and comparison procedures as explicitly taught by Noblett (Abstract).

Regarding claim 33, Corn et al teach the biomolecule interaction measuring method of claim 21 comprising:

measuring the interaction between a first biomolecule and a second biomolecule or an aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of single-stranded and double-stranded DNA sequences; Example 1), by use of a solid substrate with a solid surface comprising a background region on which a hydrophilic polymer molecule is immobilized other than the area (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, and the PEG is not on the other areas of the substrate) and a region on which said first biomolecule is immobilized (e.g., Figure 1, wherein DNA is immobilized on areas other than those where the PEG is immobilized),

wherein said first biomolecule is immobilized on said substrate by using a cross-linking agent including a heterobifunctional hydrophilic polymer molecule expressed by a general formula X-R-Y (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), wherein:

X is a functional group on a surface of a solid surface or a functional group to be bonded with a functional group introduced to the surface of said solid surface (e.g., X is the mercapto group of MUAM; column 3, lines 58-59),

Y is a functional group to be bonded to said first biomolecule (e.g., Y is the amine group of MUAM, which attaches to the DNA; step 5 of Figure 4); and

R is a repeating unit of said polymer (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4),

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

Corn et al do not teach markers indicative of spots.

However, Noblett et al teach the use of microarrays comprising immobilized nucleic acids (column 1, lines 20-30) having marks indicative of spots (i.e., fiducials, Abstract) with the added advantage of allowing positioning and alignment of the substrate for spot analysis and comparison procedures (Abstract).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the method as taught by Corn et al with the fiducials as taught by Noblett with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because the modification would have resulted in allowing positioning and alignment of the substrate for spot analysis and comparison procedures as explicitly taught by Noblett (Abstract).

3. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Corn et al (U.S. Patent No. 6,127,129, issued 3 October 2000) in view of Bambad et al (U.S. Patent No. 5,620,850, issued 15 April 1997).

Regarding claim 23, Corn et al teach the biomolecule interaction measuring method of claim 21 comprising:

measuring the interaction between a first biomolecule and a second biomolecule or an aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of single-stranded and double-stranded DNA sequences; Example 1), by use of a solid substrate with a solid surface comprising a background region on which a hydrophilic polymer molecule is immobilized other than the area (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, and the PEG is not on the other areas of the substrate) and a region on which said first biomolecule is immobilized (e.g., Figure 1, wherein DNA is immobilized on areas other than those where the PEG is immobilized),

wherein said first biomolecule is immobilized on said substrate by using a cross-linking agent including a heterobifunctional hydrophilic polymer molecule expressed by a general formula X-R-Y (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), wherein:

X is a functional group on a surface of a solid surface or a functional group to be bonded with a functional group introduced to the surface of said solid surface (e.g., X is the mercapto group of MUAM; column 3, lines 58-59),

Y is a functional group to be bonded to said first biomolecule (e.g., Y is the amine group of MUAM, which attaches to the DNA; step 5 of Figure 4); and

R is a repeating unit of said polymer (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4),

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

While Corn et al teach heterobifunctional hydrophilic polymers (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), Corn et al do not teach the heterobifunctional hydrophilic polymer

has the repeating unit -(-O-R1-)$_n$-, wherein R1 is an alkylene group and n is an integer in the range of 4 to 450.

However, Bambad et al teach immobilization of biomolecules using heterobifunctional polymers (Abstract) wherein the polymers have the repeating unit -(-O-R1-)$_n$-, wherein R1 is an alkylene group and n is an integer in the range of 4 to 450 (e.g., the polymer is X-R-Ch, wherein R is is -CH2)n-O-(CH2CH2-O)m-, where m=10 [column 10, lines 62-column 11, line4], wherein X adheres to a surface [Abstract], and wherein Ch is modified to amino [column 11, lines 26-40]; Corn et al teach that terminal amino groups make the surface hydrophilic; column 7, lines 53-54) with the added advantage that the linker (e.g., the article comprising the linker) is particularly useful in surface plasmon resonance chips (Abstract).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the method comprising linkers and detection using surface plasmon resonance as taught by Corn et al with the linkers as taught by Bambad et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because the modification would have resulted in a linker that is particularly useful with surface plasmon resonance chips as explicitly taught by Bambad et al (Abstract).

4. Claims 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Corn et al (U.S. Patent No. 6,127,129, issued 3 October 2000) in view of Bambad et al (U.S. Patent No. 5,620,850, issued 15 April 1997) as evidenced by Wade et al (Organic Chemistry, 2nd ed., Prentice Hall, New Jersey, page 966 (1991)).

Regarding claim 25, Corn et al teach the biomolecule interaction measuring method of claim 21 comprising:

measuring the interaction between a first biomolecule and a second biomolecule or an aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of single-stranded and double-stranded DNA sequences; Example 1),

by use of a solid substrate with a solid surface comprising a background region on which a hydrophilic polymer molecule is immobilized other than the area (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, and the PEG is not on the other areas of the substrate) and a region on which said first biomolecule is immobilized (e.g., Figure 1, wherein DNA is immobilized on areas other than those where the PEG is immobilized),

wherein said first biomolecule is immobilized on said substrate by using a cross-linking agent including a heterobifunctional hydrophilic polymer molecule expressed by a general formula X-R-Y (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), wherein:

X is a functional group on a surface of a solid surface or a functional group to be bonded with a functional group introduced to the surface of said solid surface (e.g., X is the mercapto group of MUAM; column 3, lines 58-59),

Y is a functional group to be bonded to said first biomolecule (e.g., Y is the amine group of MUAM, which attaches to the DNA; step 5 of Figure 4); and

R is a repeating unit of said polymer (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4),

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

Corn et al teach a thin gold layer formed on said substrate (e.g., the MUAM is absorbed on an evaporated thin gold film; column 3, lines 55-58). Corn et al also teach the first biomolecule is immobilized to the support using two compounds (e.g., MUAM is linked to the gold surface, and SMCC links MUAM to a thiolated DNA; Figure 4).

Using an alternate interpretation of claim 21, the instantly claimed compound X'-R'-Y' is interpreted to be MUAM, wherein MUAM contains X', which is a functional group reactive to said thin gold layer (e.g., X' is the mercapto group of MUAM; column 3, lines 58-59),

Y' is a functional group to be bonded to said first biomolecule (e.g., Y' is the amine group of MUAM, which attaches second linker SMCC, which attaches to the DNA; step 5 of Figure 4); and

R' is an organic unit (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4).

This interpretation of claim 21 therefore requires, in addition to the compound X'-R'-Y', a heterobifunctional hydrophilic polymer expressed by a general formula X-R-Y. While Corn et al teaches the first biomolecule is immobilized to the support using two compounds (e.g., a bifunctional linker is used to link thiol-modified DNA to MUAM pads; column 4, lines 20-24 and Figure 4), Corn et al does not explicitly teach a second hydrophilic polymer compound of formula X-R-Y.

However, Bambad et al teach immobilization of biomolecules using heterobifunctional polymers (Abstract) have the formula X-R-Y (e.g., X-R-Ch; Abstract) wherein:

X will bind with Y' (e.g., X is an acid chloride [column 9, line 63-column 10, line 25; Wade teaches acid chlorides commonly react with amines; pate 966, section 21-13)

Y is a functional group to be bonded with said first biomolecule (Ch is modified to amino [column 11, lines 26-40]; Corn et al teach that terminal amino groups make the surface hydrophilic; column 7, lines 53-54

R is a repeating unit of said polymer (e.g., R is (CH2)n; column 10, lines 40-63)

with the added advantage that the linker (e.g., the article comprising the linker) is particularly useful in surface plasmon resonance chips (Abstract).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the method comprising two linkers and detection using surface plasmon resonance as taught by Corn et al by using the linkers as taught by Bambad et al as the second linker with a reasonable expectation of success. The ordinary artisan would have been motivated to

make such a modification because the modification would have resulted in a linker that is particularly useful with surface plasmon resonance chips as explicitly taught by Bambad et al (Abstract).

5. Claims 21, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Corn et al (U.S. Patent No. 6,127,129, issued 3 October 2000) in view of Wiegel et al (U.S. Patent No. 6,107,034, issued 22 August 2000).

Regarding claim 31, Corn et al teach the biomolecule interaction measuring method of claim 21 comprising:

measuring the interaction between a first biomolecule and a second biomolecule or an aggregate thereof (e.g., measurement of SPR imaging measurements are take of the binding of single-stranded DNA binding protein to an array of single-stranded and double-stranded DNA sequences; Example 1), by use of a solid substrate with a solid surface comprising a background region on which a hydrophilic polymer molecule is immobilized other than the area (e.g., Figure 1, wherein PEG is the hydrophilic polymer [column 10, lines 27-28] on the background region, and the PEG is not on the other areas of the substrate) and a region on which said first biomolecule is immobilized (e.g., Figure 1, wherein DNA is immobilized on areas other than those where the PEG is immobilized),

wherein said first biomolecule is immobilized on said substrate by using a cross-linking agent including a heterobifunctional hydrophilic polymer molecule expressed by a general formula X-R-Y (e.g., the oligonucleotides are attached using the cross-linker MUAM [column 4, lines 1-3, and Figure 4], wherein MUAM is hydrophilic, column 7, lines 53-54), wherein:

X is a functional group on a surface of a solid surface or a functional group to be bonded with a functional group introduced to the surface of said solid surface (e.g., X is the mercapto group of MUAM; column 3, lines 58-59),

Y is a functional group to be bonded to said first biomolecule (e.g., Y is the amine group of MUAM, which attaches to the DNA; step 5 of Figure 4); and

R is a repeating unit of said polymer (e.g., R is the CH2 of MUAM, which repeats eleven times; step 5 of Figure 4),

wherein said biomolecule interaction measuring method utilizes surface plasmon resonance (e.g., Figure 5 and Example 1, wherein SPR imaging measurements of the binding of single stranded binding protein to arrays of double-stranded sequences are performed).

While Corn et al also teach the second biomolecule is a protein (e.g., single-stranded DNA binding protein; Example 1), Corn et al do not specifically teach transfer factors.

However, Wiegel teaches the detection of binding of a transfer factor to nucleic acids (e.g., GATA-3 binding to the DNA motif recognized by the protein; column 3, lines 52-63) and the use of nucleic acid arrays (column 6, lines 3-14) with the added benefit that detection of the transfer factor GATA-3 provides a diagnostic test for a hormone responsive tumor (Abstract).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was claimed to have modified the method comprising detection of protein binding as taught by Corn et al with the transfer factor protein GATA as taught by Wiegel et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because the modification would have resulted in providing a diagnostic test for a hormone responsive tumor as explicitly taught by Wiegel (Abstract).

Response to Arguments

Applicant's arguments filed 5 July 2006 (i.e., the "Remarks") have been fully considered but they are not persuasive for the reason(s) listed below.

1. The rejection of claim 22 under 35 USC 112, second paragraph, is withdrawn in view of Applicant's arguments on page 13 of the Remarks.

2. Applicant notes on pages 16-17 that it is unconventional to include claims 17 and 21 in the rejections under 35 USC 103(a). Because the all of the limitations of independent claims 17 and 21 are

discussed in the rejections of the dependent claims under 35 USC 103(a), and because the examiner has reiterated the teachings of those limitations in the rejections of the dependent claims under 35 USC 103(a), the numbers of the independent claims have been included in the opening paragraphs of the rejections under 35 USC 103(a) merely as an indication that the independent claims are discussed in the course of the obviousness rejections of the dependent claims.

3. Applicant's remaining arguments have been considered but are moot in view of the withdrawn rejections and the new ground(s) of rejection necessitated by amendment.

Conclusion

1. No claim is allowed.

2. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

3. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert T. Crow whose telephone number is (571) 272-1113. The examiner can normally be reached on Monday through Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla can be reached on (571) 272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Robert T. Crow
Examiner
Art Unit 1634

JULIET C. SWITZER
PRIMARY EXAMINER